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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/091,515	03/07/2002	Philip Charles Danby Hobbs	YOR920010496US1	8797

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EXAMINER	
SONG, SARAH U	

ART UNIT	PAPER NUMBER
2874	

DATE MAILED: 03/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/091,515	HOBBS ET AL.	
	Examiner	Art Unit	
	Sarah Song	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 December 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-47* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 May 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's communication filed on December 16, 2005 has been carefully considered and placed of record in the file. Claim 35 has been amended. Claims 1-47 are pending.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. **Claims 1-5, 10-16, 21-23, 34, 37, 39, 46 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moddel et al. (U.S. Patent 6,563,185 previously relied upon).**

4. Regarding claim 1, 39 and 46, Moddel et al. discloses an apparatus for producing a modulated optical signal, comprising an antenna (e.g. 222A, 223A) for communicating with a waveguide and with an externally-applied optical field (e.g. 202A) and having an output port; and an electrically-variable-impedance device connected at the output port of the antenna, capable of responding at a frequency of an externally-applied optical field and having its impedance at the optical frequency changed by an applied electrical signal (i.e. voltage). See column 14, lines 32-53. Moddel et al. also discloses the device capable of responding to more than one frequency to radiate a mixing product between the optical frequencies. See column 14, lines 4-31. See Figure 3A.

5. Regarding claims 12 and 47, Moddel et al. also discloses an apparatus for detecting an optical signal, comprising an antenna structure (e.g. 20B, 21B) having an output port; and an electrically-connected detector connected at the antenna's output port, capable of responding at a

frequency of the optical signal in a waveguide and for producing a detected electrical signal at baseband. See column 3, lines 17-41. Moddel et al. also discloses the device capable of responding at more than one frequency producing a detected electrical signal at a frequency corresponding to a mixing product of the optical frequencies. See column 20, line 67 through column 21, line 30. See Figure 1B.

6. Moddel et al. does not expressly disclose a waveguide communicating with the antenna of Figure 3A or 1B. However, Moddel et al. discloses a similar antenna device in Figure 2F in communication with a waveguide. Furthermore, waveguides are well known in the art for providing low loss propagation of optical signals. The modification would have been obvious since Moddel et al. suggests the disclosed devices for high speed optoelectronic integrated circuits (column 20, lines 52-59), which are known in the art to comprise waveguide circuits. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a waveguide in communication with the antennae 222A, 223A or 20B, 21B of Moddel et al. in order to provide low loss propagation of the optical signal to or from the device.

7. Regarding claims 2-4, 10, 11, 13-15 and 21-23, the electrically-variable-impedance device comprises a tunnel junction, wherein the tunnel junction comprises a metal-insulator-metal (MIM) structure. More specifically, the MIM tunnel junction comprises closely juxtaposed metal lines with a layer of metal oxide therebetween. See column 7, line 50 through column 8, line 6. Additionally, the electrically-connected detector comprises a semiconductor tunnel junction. See column 16, lines 65-67. Furthermore, Moddel et al. discloses the device may comprise a metal-insulator-superconductor barrier. See column 6, lines 51-53.

8. Regarding claims 5 and 16, Moddel et al. does not expressly disclose the metal line comprising nickel and the oxide comprising nickel oxide. Nickel and nickel oxide were known in the art at the time of the invention as a suitable material for a MIM tunnel junction for an optical device. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide nickel and nickel oxide in the MIM tunnel junction of Moddel et al. since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. See MPEP 2144.07.

9. Regarding claims 6 and 17, Moddel et al. discloses the area of the junction to range from sub-microns up to hundred of microns but does not expressly disclose the area of the junction to be less than 100 nm square. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the claimed dimension in order to provide a wavelength specific device since Moddel et al. teaches that scaling antenna dimensions affects the wavelength range of the device.

10. Regarding claims 7 and 18, Moddel et al. does not expressly disclose a capacitance to be less than 100 attofarads. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a capacitance of less than 100 attofarads since it has been that discovering optimum or workable ranges involves only routine skill in the art. See MPEP 2144.05(II)(A)(B).

11. Regarding claims 8, 9, 19 and 20, Moddel et al. does not expressly disclose a Josephson junction or a Schottky barrier. Josephson junctions and Scottky barriers were well known in the art for tunneling devices at the time of the invention. Therefore, it would have been obvious to

one having ordinary skill in the art at the time the invention was made to provide any well known tunneling junction since applicant has not disclosed that the particular junction solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well with any type of tunneling optical device.

12. Regarding claims 24 Moddel et al. discloses an apparatus comprising a transmitting antenna (e.g. 120C, 121C) for communicating with a waveguide and having an output port; and an electrically-variable-impedance device connected at the output port of the transmitting antenna, capable of responding at a frequency of an externally-applied optical field and having its impedance at the optical frequency changed by an applied electrical signal (i.e. voltage). See Figures 2B and 2C. Moddel et al. also discloses an apparatus comprising a receiving antenna structure (e.g. 20B, 21B) having an output port; and an electrically-connected detector connected at the antenna's output port, capable of responding at a frequency of the optical signal in a waveguide and for producing a detected electrical signal at baseband. See Figures 1A and 1B.

13. Moddel et al. does not expressly disclose a waveguide in communication with both the transmitting and receiving antennae. However, Moddel et al. discloses a similar antenna device in Figure 2F in communication with a waveguide. Furthermore, waveguides are well known in the art for providing low loss propagation of optical signals. Moddel et al. also discloses in integrated circuits. The modification would have also been obvious since Moddel et al. suggests that the devices may be combined to have applications in high speed optoelectronic integrated circuits (column 20, lines 52-59), which are known to comprise waveguides. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a waveguide in communication with the antennae 222A, 223A or 20B, 21B of Moddel et

al. in order to provide low loss propagation of the optical signal to or from the device in a compact device.

14. Regarding claims 25-27, 33 and 34, Moddel et al. discloses a source of optical radiation incident on the transmitting antenna by unguided propagation (performed above a top surface of said waveguide). See Figure 3A. Although guided propagation (e.g. along said waveguide) of the optical radiation incident on the antenna is not expressly disclosed, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide guided propagation since it was known in the art to guide the optical radiation around any additional components of an integrated circuit.

15. Regarding claims 28-30, the method claims would also have been obvious as setting forth requisite steps for operation of the devices as discussed above.

16. Regarding claims 31, it is noted that a portion of the externally-applied optical field is scattered (as a result of modulation) within said waveguide.

17. Regarding claims 36 and 37, Moddel et al. appears to disclose direct detection. However, coherent detection was also known in the art as an alternative to direct detection and therefore would have been obvious to one of ordinary skill in the art.

18. Regarding claim 32, 35 38 and 40-45, Moddel et al. disclose various applications for the devices in place of prior art semiconductor devices, which were known in the art to be utilized in fiber LANs, optical backplanes comprising circuit boards, chip modules, communication systems comprising a plurality or interconnects for one-to-many or many-to-many connections. Therefore, the incorporation of the device of Moddel et al. in to the various prior art systems

would have been obvious in order to provide advantages of speed, simplified input/outputs, and ease of fabrication as taught by Moddel et al. See column 20, lines 38-67.

Response to Arguments

19. Applicant's arguments filed December 16, 2005 have been fully considered but they are not persuasive. Applicants state that the antenna described in Moddel are not described as being anything except free-space devices, thus does not satisfy the plain meaning of the claim language requiring the interface with a waveguide.

20. The previous rejection incorrectly stated that Moddel et al. did not expressly disclose a waveguide. Upon further review of the prior art, it is clear that Moddel et al. suggests at least one example of a waveguide-antenna interface in Figure 2F. Further suggestions for a waveguide interface include applications of the device in optoelectronic integrated circuits (column 20, lines 52-59), which are known in the art to comprise waveguides. Therefore, the rejection previously set forth has been modified to indicate the relevant portions of Moddel et al. that provide suggestions for interfacing the antenna of Moddel et al. with a waveguide, therefore satisfying the recitation, "for communication with a waveguide".

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sarah Song whose telephone number is 571-272-2359. The examiner can normally be reached on M-Th 7:30am - 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on 571-272-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Sarah Song
Primary Examiner
Group Art Unit 2874